

# THE ARMY'S SmarTruck: A TRUE TECHNOLOGY DEMONSTRATOR

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## Introduction

One of the Army's latest inventions, SmarTruck, is a concept vehicle designed to provide the Army a commercial vehicle platform to test, integrate, and showcase cutting-edge, dual-use automotive technologies. SmarTruck allows the Army to investigate the latest in wireless communications, situational awareness, and soldier safety technology for potential insertion into its light-weight tactical wheeled vehicle (TWV) fleet.

The idea for SmarTruck originated in response to Army Chief of Staff GEN Eric K. Shinseki's vision for the Army of the future: "Soldiers on Point for the Nation . . . Persuasive in Peace, Invincible in War," with the goals to become more "Responsive, Deployable, Agile, Versatile, Lethal, Survivable and Sustainable." Army transformation represents the actions that must occur for the Army to accomplish Shinseki's goals. To do this, the Army must change the way it currently thinks, trains, and fights. This change must also be reflected in its vehicle fleet. The Army needs to develop strategies to modernize and equip its light TWV fleet with dual-use technology and also devise vehicles that are capable of plug-and-play functionality.

As Shinseki's Army transformation plan began to take shape, military strategists questioned how they would put his vision into action. Specifically, they were seeking a truck that was lighter, faster, and safer, while also being affordable.

The U.S. Army Tank-automotive and Armaments Command's

(TACOM's) National Automotive Center (NAC) took the initiative to support Shinseki's transformation goals and prove that specific commercial technologies, which met military mission requirements, could be integrated on a single testbed. They took an innovative approach by brainstorming ideas about futuristic vehicle weaponry systems.

After NAC personnel gathered ideas, they assembled a team of commercial partners, including Delphi Automotive Systems, Integrated Concepts and Research Corp., and MSX International, with whom they could share both state-of-the-art technology and the costs of developing the SmarTruck. Through this cost-sharing approach, NAC produced a state-of-the-art concept vehicle, which uses commercially available off-the-shelf products, within 7 months from inception to completion. In addition, SmarTruck can be quickly repaired with minimal cost because it is built on a standard Ford F-350 platform. SmarTruck could have been built on any commercial platform that fit the specifications, i.e., Dodge or General Motors; however, the team chose Ford.

## What Is SmarTruck?

SmarTruck is the Army's newest technology demonstrator, equipped with the latest in automotive assets and nonlethal weaponry. The engineers at NAC modified a standard Ford extended crew cab F-350 measuring 8 feet (including mirrors) by 6 feet by 22 feet and weighing 10,000 pounds. They added 1,000 pounds to the standard chassis, lowered the

body by 2 feet, outfitted everything but the floorboards with Armormax (a Kevlar-like ballistic cover), and added 1-inch-thick bulletproof glass (3-A rated) to the front, back, and side windows. On the doors, the engineers provided additional protection by installing a 3-A rated ballistic covering for protection against small arms such as .44- and .357-caliber Magnums, 9mm handguns, and M-16s. The cost of armoring the entire demonstration vehicle would have been prohibitively expensive.

The truck seats four—a driver and three crewmembers. The seats in the back of the vehicle slide to allow the user greater access to three flat-screen panel displays and a joystick control, which operate the onboard countermeasures and weapons station. User identity is confirmed using a biometric fingerprint identification device. Once access is granted, the user can deploy the onboard countermeasures (dazzling lights; high-voltage door handles; and oil slick, smoke screen, pepper spray, and tack dispensers) and the night vision system. At the touch of a button, pepper spray can be dispensed from the top of the vehicle to disorient rioters at a distance of up to 12 feet. High-voltage door handles delivering 110 volts/30 amps, enough voltage to temporarily stun an intruder or thwart would-be attackers, can also be activated from the same flat-screen panel.

The smoke screen, which pumps smoke out of the vehicle's exhaust pipe, obscures pursuers' vision, as do the dazzling lights mounted on the front and rear bumpers. The lights



*SmarTruck PC/custom dash*



*SmarTruck exterior*

temporarily disorient enemies so that they cannot look directly at the vehicle or pursue it. The front lights can pan and tilt 90 degrees, giving the user additional effectiveness. When activated, oil from the truck's reservoir is released through a pipe with several small holes in it, causing pursuers to lose control of their vehicle. Should the pursuers evade the oil slick, the SmarTruck can dispense 30 to 35 2-inch tacks, which always hit the ground with one sharp point in the upright position, immediately blowing out the tires of the pursuing vehicle. Run-flat tires on the SmarTruck ensure that the user can complete his or her mission in the event of a flat.

Some of the other capabilities of the SmarTruck include the following:

- **Bomb detection system.** An array of sensors placed around the vehicle detect any disturbances in the magnetic field. Should any disturbances occur, the LED blinks, warning the driver of danger.
- **Vehicle PC.** A ruggedized onboard event recorder, much like the black box of an airplane, can be attached to cameras that record outside via the weapons control station.
- **Truck PC.** SmarTruck uses a touch screen monitor to display National Imagery and Mapping Agency maps. It also displays

vehicle-to-vehicle and vehicle-to-base e-mail communications and load-management status via satellite.

- **ECLIPSE Commander.** This replaces the existing radio on the dashboard and provides limited Global Positioning System (GPS) capability to guide the driver to new locations and pinpoint selected destinations. The radio, cell phone, and power door locks can be controlled via voice activation.

### **SmarTruck Objectives**

Engineers at NAC thought long and hard about what the SmarTruck could be and do. The SmarTruck Program supports the Army's transformation goal for the next generation of military vehicles as well as the 21st Century Truck Initiative. (See article on Page 23 of the September/October 2000 issue of *Army AL&T* magazine.) The SmarTruck testbed was designed to show that the technology exists today to give soldiers the ability to employ nonlethal weapons to defend themselves within the confines of the rules of engagement for peacekeeping operations. Some Army missions today are peacekeeping and policing activities. The SmarTruck was also designed to give the soldier the ability to control a situation using nonlethal measures, coupled with the ability to use deadly force in case the situation escalates.

Some of the other objectives for the initial SmarTruck Program include the following:

- Integrate and demonstrate a hybrid-electric drivetrain for improved fuel economy in the long range;
- Increase voice-activation capabilities within the vehicle;
- Develop and evaluate a satellite-linked data acquisition system and flight recorder box for improved soldier safety;
- Lower maintenance, operating, and support costs using onboard computers for improved and faster diagnostics and service;
- Demonstrate multiple databus network on military trucks;
- Reduce cost-of-vehicle upgrades by embracing plug-and-play commercial off-the-shelf technology; and
- Share the cost of research and development with private industry.

### **Why SmarTruck?**

SmarTruck can potentially be deployed on peacekeeping missions, be used to transport and protect America's dignitaries in times of unrest, or help thwart terrorist attacks on our foreign embassies or here at home. It can also be used to perform policing duties, as the Army is increasingly deployed in urban

environments. Because of its resemblance to a sport utility vehicle (SUV), the SmarTruck does not draw attention to itself and can be used for such assignments as transporting diplomats, members of Congress, or the president in motorcades. A long list of agencies—the Drug Enforcement Administration, the U.S. Border Patrol, the Federal Bureau of Investigation, the U.S. Marshals Service, U.S. Army Special Operations, the New York Port Authority, the Secret Service, and local sheriff departments—have already expressed interest in a vehicle like the SmarTruck.

The SmarTruck is not yet being produced. It is considered to be a technology demonstrator, one that can be customized for the needs of the agencies listed above or other interested parties.

### Partnering Produces Results

By partnering with leaders in the automotive industry, using readily available commercial products and a commercial platform, the military considerably reduces the cost of producing and maintaining the SmarTruck. According to Paul F. Skalny, Associate Director of the NAC, “It makes sense to share the task of introducing technologies that consumers want and that our soldiers need. By working together, we can get the job done better, faster, and cheaper. Everyone wins.” The automotive companies are just as excited about the partnership and the opportunity to showcase new technologies and see how they hold up under demanding test conditions. Delphi Automotive Systems is using the SmarTruck as a testbed for its QUADRASTEER four-wheel steering system, which grants full-size vehicles greater maneuverability at low speeds and improved stability and handling at higher speeds. Larry Tomczak, Director of Engineering at Delphi’s Saginaw Steering Systems Division, says, “The key attribute [of participating in the SmarTruck Program] is being able to evaluate QUADRASTEER. We can get a better

assessment on how the vehicle can be exposed. It’s a chance to learn about how well our technology works.”

### SmarTruck II

NAC engineers and their partners have begun planning the second iteration of the SmarTruck concept vehicle. The next SmarTruck will be combined with the NAC’s COMBATT (COMmercially Based Tactical Truck), which leverages commercial technology to fulfill military mission needs. Vehicles that are currently part of the COMBATT Program have shown that using this approach results in better off-road mobility and payload capacity. An added benefit is being able to provide continuous improvement via automotive technology developed by the private sector at no cost to the Army.

The COMBATT Program has proven that economies of scale and commercial state-of-the-art technology result in lower operating and support costs. The future SmarTruck will integrate COMBATT and SmarTruck technologies and be designed with an urban environment in mind. The platform for the next iteration vehicle has not yet been chosen. However, the vehicle will not be camouflaged like the current COMBATT vehicles; instead it will look more like an SUV.

### Future Capabilities

The future SmarTruck will include multidatabus electrical architecture (J-1850, IDB-CAN, J-1939, MOST, and wireless); an alternative propulsion system (most likely hybrid electric); voice activation; and robotic reconnaissance capabilities. Upgrading to multidatabus capabilities means that the standard vehicle original equipment manufacturer’s databus will be combined with a fiber-optic databus, giving the SmarTruck multimedia capabilities.

SmarTruck passengers will be able to view electronic repair, operator, and parts manuals. Depending on the system chosen, the alternative hybrid-electric propulsion system, in

addition to allowing the vehicle to operate in stealth mode, will enable the vehicle to reach a speed of 100 kilometers per hour in less than 7 seconds. By adding a state-of-the-art voice activation system, the user will be able to vocally control the non-lethal countermeasures, the GPS system, and the communication systems. The future iteration of the SmarTruck will have robotic reconnaissance capability, which will allow the user to deploy a robot from beneath the vehicle to investigate a potentially dangerous situation from a remote location. Other additions to the next iteration SmarTruck include the following:

- QUADRASTEER by Delphi, a steering system that uses all four wheels to steer. It gives the truck increased maneuverability and the ability to make extremely sharp turns.
- A central tire inflation system, which allows vehicles to move over all types of terrain with ease, thus improving mobility, traction, and comfort.
- A nuclear, biological and chemical detection system.
- A collision warning system that alerts drivers about impending danger.
- A fingerprint identification system for entry to the vehicle.

Soldiers traveling through enemy territory in the SmarTruck will have enough technology to protect themselves, disorient the enemy, and complete their mission. What will the NAC engineers think of next?

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